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Enrollment and Demographic Characteristics Of Physician's Assistant Students

Reginald Carter, Ph.D., Joyce Emelio, and Henry Perry, M.D.

Abstract—The authors in this paper describe enrollment trends and provide demographic information for a representative sample of physician's assistant (PA) students enrolled during 1978–1982 in 46 PA programs accredited by the American Medical Association. In February 1983, there were 2,871 such students enrolled in 54 primary care and three surgeon's assistant programs. The typical PA program, which is two years in length, provides six to nine months of preclinical course work and nine to 15 months of clinical experience. Most programs are based in either medical schools or four-year colleges and offer baccalaureate degrees. From the demographic information obtained by the authors from this sample, the typical PA student is 28 years old and has three to four years of college and one to two years of prior health care experience. There has been a steady increase in the enrollment of women and individuals with four or more years of college. More than half of the PA students enrolled in 1983 were women. Former military medical corpsmen, who once predominated the PA profession, now represent only a small proportion of the PA student population. Most PA students continue to want to practice with family practitioners in small communities.

Physician's assistants (PAs) are skilled health practitioners qualified by academic and clinical experience to provide patient care services under the supervision and direction of a licensed physician (1). Educational programs for PAs were first established in the late 1960s largely as a result of the pioneering efforts of the Duke University Physician Assistant Program, the University of Colorado Child Health Associate Program, and the MEDEX Program of the University of Washington (2). The maintenance of high quality care, increased access to medical care services, and the containment of costs for these services remain underlying goals for the PA graduates of today. PA programs are accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association (AMA). Through its Joint Review Committee on Educational Programs for Physician's Assistants, the

The project reported here was funded by the Robert Wood Johnson Foundation, the Educational Research Foundation of the American Academy of Physician Assistants, and the National Center for Health Services Research (Department of Health and Human Services).

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CAHEA evaluates programs periodically to ensure that all programs meet and maintain the established minimum standards. The review committee consists of two members each from the American Academy of Family Physicians, the American Academy of Pediatrics, the American Academy of Physician Assistants, the American College of Physicians, the American College of Surgeons, the American Medical Association, and the Association of Physician Assistant Programs.

Although much has been written about PAs, there continues to be many misconceptions about the education, backgrounds, and career interests of those entering the profession. The authors in this paper describe the current educational process, including student enrollments, and provide demographic information for a representative sample of PA students enrolled between 1978 and 1982 in 46 U.S. accredited programs.

Data Sources

Enrollment and other information about PA educational programs were compiled from data submitted by the programs to the Association of Physician Assistant Programs (APAP) in April 1982. Supplemental data for figures illustrating trends in demographic characteristics of PAs were drawn from national surveys of PA graduates conducted by the APAP in 1976, 1978, and 1981 (3–5).

Institutions

The first physician's assistant program was established in 1965, and within four years at least six additional programs were initiated in a variety of institutional settings. The major period of expansion was from 1970 to 1974, when over 30 programs began operation.

As of 1983, there were 54 accredited educational programs for the assistant to the primary care physician and three accredited surgeon's assistant programs. Four of the primary care programs are operated by the federal government. Three of the federal programs are military-based, and one is administered by the Indian Health Service. The remaining nonfederal programs are equally divided between privately and publicly operated institutions (6).

Of the 50 nonfederal, primary care programs, 16 are located in medical schools, 25 are based in schools of allied health education or four-year colleges, five are administered by community colleges, three are hospital-based, and one is located in an osteopathic medical school. Two of the three surgeon's assistant programs are based in medical schools, while the other is administered by a community college. It is important to note that regardless of the institutional setting, all programs have clinical teaching affiliations with medical schools or medical school faculties.

Since 1974, there has been a 21 percent increase in PA programs granting baccalaureate degrees. Of the 51 APAP member programs, 37 award baccalaureate degrees. Twenty-six of these 37 baccalaureate programs offer a certificate option or grant a certificate in addition to the degree, and one program offers a master of science option. The remaining programs are certificate or combined certificate/associate degree programs (7).

CURRICULA CONTENT

The typical physician's assistant educational program is a two-year program consisting of preclinical course work and clinical instruction. Preclinical study, ranging from six to 12 months in duration, includes courses in anatomy, physiology, microbiology, pharmacology, psychology, clinical medicine, physical diag-

nosis, clinical laboratory procedures, preventive medicine, health policy issues, and medical ethics. This is accompanied by clinical practicums lasting from nine to 15 months, which are designed to develop practitioner interviewing, physical assessment, and counseling skills. The clinical practicums, composed of clinical rotations and preceptorships, introduce the PA student to a number of potential areas of expertise, including family medicine, internal medicine, surgery, pediatrics, psychiatry, obstetrics/gynecology, and emergency medicine (1). These comprehensive preclinical and clinical experiences prepare PAs to perform duties that include: (*a*) eliciting a comprehensive health history, (*b*) performing a comprehensive physical examination, (*c*) ordering and interpreting simple diagnostic laboratory determinations, (*d*) developing diagnoses and management plans, (*e*) providing basic treatment for individuals with common illnesses, and (*f*) providing clinical care for individuals with commonly encountered emergency needs (8).

Over the past decade, a number of evaluative studies have focused on PA education in order to measure the effectiveness of programs in educating these primary care providers. This evaluative process has led to the development of a number of innovations in medical education. For example, PA educators have pioneered the use in their programs of clinical algorithms, patient management problems, computer-based clinical simulations, and patient instructors. Also, they have been innovative in the development of new teaching methodologies in clinical behavioral sciences and clinical interpersonal skills, such as role-playing, interpersonal process recall, and videotaped interviews. Patient education, interviewing and history-taking, health counseling, and preventive medicine are recognized within PA programs as integral parts of comprehensive primary care education.

Another innovation originated by PA programs, particularly the MEDEX programs, is the demonstration of how practitioners can be employed in medically underserved areas after completing preceptorships in those areas (9). This is accomplished by a deployment system which identifies and encourages M.D. preceptors located in underserved areas to employ and train MEDEX personnel who will remain in the practice upon completion of the program. Careful attention is given to matching preceptors with preceptees.

POSTGRADUATE PROGRAMS

Recently, a number of postgraduate programs have emerged to provide advanced educational experiences for physician's assistants in certain medical and surgical disciplines. Often termed "PA residencies," these programs accept graduates of PA programs and offer additional clinical and structured learning experiences in specialty areas. Presently at least 11 residency programs exist, and another is being developed. There are residencies in surgery, emergency medicine, pediatrics/neonatology, and occupational medicine. Only two postgraduate programs, one in occupational medicine and one in pediatrics, offer a master's degree.

The typical PA postgraduate program takes 12 to 15 months to complete and accepts 10 to 15 candidates each year. In 1983, these programs enrolled 95 individuals. Presently, there is only one postgraduate position available for every 15 PA students graduating each year.

Student Enrollment

In February 1983, there were 2,871 students enrolled in 54 primary care and the three surgeon's assistant accredited programs. Approximately half of these students were enrolled in the first year and half in the second year of instruction.

Class sizes ranged from a minimum of 10 students to a maximum of 50 (7). Privately operated programs had an average class size of 30.5 students, compared with an average class size of 26.5 students in publicly operated programs.

Collectively, PA programs enroll and graduate between 1,400 to 1,500 students each year. There has been little change in enrollments since the mid 1970s.

Table 1 shows a steady increase in the number of women enrolled in PA programs during 1978–1982. During this period, the proportion of women increased by about 8 percentage points and now makes up the majority of the students enrolled. Medical school-based programs had the highest percentage of women enrolled with 57 percent, and community colleges had the least with 40 percent. The number of blacks and other minorities changed little over the five-year period.

The typical applicant to a PA program is an "adult learner interested in a lifelong career in the science and art of medicine serving humanity in areas of unmet need" (10). For admission into most PA programs, candidates must have at least two years of college and from six months to one year of prior health care experience. The majority of applicants exceed these minimum requirements and have baccalaureate degrees in biological and social sciences as well as one or more years of direct patient care experience.

Applicants are encouraged to apply to several different programs, since competition is keen for the limited number of positions available. Although the total applicant pool for PA programs has not been quantified, the APAP estimates that the ratio of applicants to positions in 1983 was about four to one. This is down from a ratio of six to one reported by programs in 1978.

In 1981, the APAP surveyed its 51 member programs to collect enrollment

TABLE 1

Number and Percentage of Physician's Assistant Students by Sex and Race for the Graduating Classes of 1978–1982*

Variable	1978		1979		1980		1981		1982	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Sex										
Men	608	53.8	571	52.0	567	47.7	573	47.8	497	45.8
Women	523	46.2	527	48.0	622	52.3	627	52.2	587	54.2
Total	1131	100.0	1098	100.0	1189	100.0	1200	100.0	1084	100.0
Race										
White	981	88.6	968	89.7	1030	88.5	1033	88.1	944	89.3
Black	66	6.0	52	4.8	74	6.4	76	6.5	60	5.7
Other	60	5.4	59	5.5	60	5.1	64	5.4	53	5.0
Total	1107	100.0	1079	100.0	1164	100.0	1173	100.0	1057	100.0

* Number of programs reporting data varied from 42 to 46.

data. For the 46 programs which responded, the attrition rate of students enrolled between 1978 and 1981 was 5.4 percent. The major causes of attrition included academic, financial, personal, and family related problems (10). Many PA programs provide two or more weeks of preparatory course work and tutoring for scholastically disadvantaged students. Programs assist financially disadvantaged students to secure low interest loans, scholarships, or work-study positions. Because of the academic and time-demanding nature of the curriculum, most programs provide students academic advisers and access to psychologists, family counselors, and educational learning specialists. Students are encouraged to remain healthy through use of stress relaxation techniques, formation of support groups, and exercise programs. To share potential personal growth experiences, spouses and significant others are encouraged to attend classes and seminars on human sexuality, parenting, and other appropriate subjects.

Student Characteristics

The age distribution of male and female PA students enrolled in academic year 1981–82 is shown in Figure 1. The average age of this PA student population was

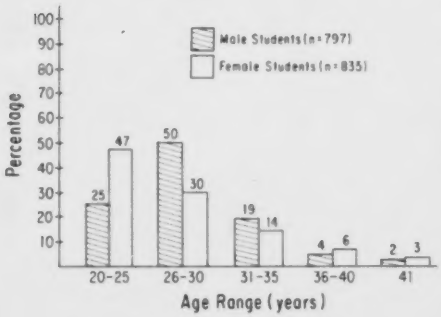

FIGURE 1

Distribution of male and female physician's assistant students by age, 1981–82.

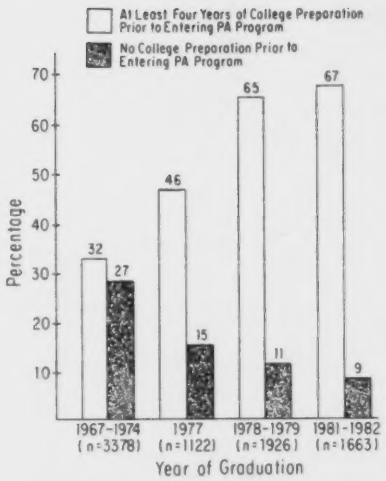

FIGURE 2

Extent of college preparation of physician's assistant students prior to entering a physician's assistant program by year of graduation.

28 years. The youngest student was 20, and the oldest was 56 years old. Male students tended to be slightly older than female students. More specifically, the median age of male students was 27.2 years, compared with 26.5 years for female students. The average age of the PA student population changed little from the 27.7 years reported for academic year 1978–79. At that time, 29 percent of the males and 27 percent of the females were over 30.

As shown in Figure 2, prior academic preparation among enrollees has been increasing steadily. Ninety-one percent of the students responding to the 1981 national survey by the APAP had attended college, with 66 percent earning a degree. Of those not receiving degrees, about two-thirds had obtained credits equivalent to two or more years of college. About two-thirds of the baccalaureate degrees were earned in the natural sciences or health fields.

Almost all (97.6 percent) of the stu-

TABLE 2

Number, Percentage, and Median Months of Previous Health Care Experience of Physician's Assistant Students Enrolled in 1981–82 for Five Selected Health Fields

Previous Health Field	Students with Experience		
	No.	Percent*	Median (Months)
Nursing aide/orderly	542	33.5	15
Emergency medical technician	386	23.8	25
Military corpsmen	219	13.5	45
Registered nurse	139	8.6	78
Medical laboratory technician	128	7.9	23

* Based on total number responding to question, $n = 1,619$.

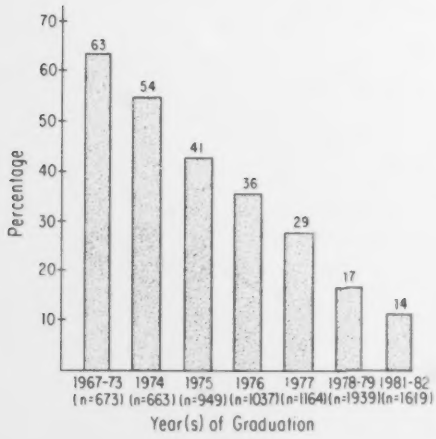

FIGURE 3

Percentage of physician's assistant students with previous military experience by year of graduation.

dents surveyed in 1981 had previous health care experience prior to beginning their PA education. About one-third of the responding students had previous experience working as orderlies or nurse's aides, one-fourth as emergency technicians, and one-fourth as registered nurses or military medical corpsmen. The median amount of previous health experience for the five selected fields is shown in Table 2, along with the percentage of students having experience in each of those fields. As shown in Figure 3, there continues to be a downward trend in the percentage of students with prior military medical corpsman experience. This downward trend is also reflected in the number of students who are veterans. Twenty percent of the 1981–82 students had been in the military as compared with 26 percent in 1978–1979.

Forty-seven percent of the 1981–82 graduating students preferred to work with family medicine or general practitioners, a decrease from the 57.8 percent who cited that preference in 1978–79. During this same period, a proportionately greater percentage (11.7 versus 8.4 percent) of students preferred to work in emergency medicine. A majority of the 1980–81 students (69.0 percent) preferred working in a community with a population of 50,000 or less, and 53 percent indicated a willingness to work in medically underserved areas.

Two-thirds of the 1981–82 students indicated a preference to practice in office or clinic settings. A slightly increased percentage of students (from 10.1 to 14.7 percent) preferred to work in a hospital setting. Otherwise, little change was noted in preference categories between 1978–79 and 1981–82 students.

Conclusions

Physician's assistant programs remain distributed fairly widely among different educational settings. Over 50 programs are offered at medical schools and four-year colleges affiliated with teaching hospitals. PA program curricula provide instruction in biomedical, behavioral, and clinical skills. Programs sponsored by the uniformed services have been maintained since the early 1970s.

Students' academic preparation prior to entering PA programs continues to lengthen. The percentage of PA students with at least four years of college education prior to beginning their PA studies has more than doubled since 1974. In addition, the vast majority of currently enrolled students have had health care experience prior to entering their PA program. Former military medical corpsmen now represent only a small percentage of the health-related backgrounds of enrolled students.

There has been little change in the demographic characteristics of the students since the academic year 1978–79, except that the enrollment of women had increased from 46.2 to 54.2 percent as of 1982–83. The majority of students continue to want to practice with family practitioners in small communities.

Physician's assistant programs have made remarkable progress in the past decade in developing innovative and relevant curricula, including the training and subsequent deployment of students to medically underserved areas, attracting high quality students, and increasing the number of women enrolled.

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Factors Affecting the Choice of Anesthesiology By Medical Students for Specialty Training

Phool Chandra, M.D., and Mark Hughes

Abstract—To learn some of the reasons why anesthesiology as a specialty is not preferred by more graduating medical students and to determine the effects of various factors on their specialty choice, the authors studied the number of medical students who chose anesthesiology as a specialty after graduation and the quality of clerkships available in various departments. The study established that medical students do not find anesthesiology as attractive as other specialties and that several factors are related to the students' choice of anesthesiology. Most surprising was the negative effect of the presence of certified registered nurse anesthetists on the operating room floor. These results suggest the need for a thorough study of the use of nurse practitioners, physician's assistants, and nurse-clinicians, at least where teaching of medical students is taking place.

It is well known that support specialties as defined by the National Resident Matching Program (NRMP) have difficulty in attracting graduate medical students. Yet the demand for the health care services of these support specialties continues at about the same or slightly higher rate than in the past. Graettinger (1) suggested in 1978 that some patient services might be met by "nurse-clinicians, assistants to physicians, and salaried house physicians." Levin and colleagues (2) in 1979 pointed out that this was the feeling of national policymakers, as represented by former Department of Health, Education, and Welfare officials (3). But is this the correct approach to meeting demand for the anesthesia services? The answer to this question depends, at least to some degree, on whether or not the use of "nonphysicians" promotes a "positive" attitude on the part of the graduating medical student. In this study, an attempt has been made to explore some of the factors surrounding the clinical clerkship setting that may affect the medical student's preference for anesthesiology.

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Methods

Data related to the anesthesiology resident programs were obtained from two sources and analyzed. Data were extracted from summary statistics provided by the NRMP for 1978 and 1980–1983, and original source data were collected through the use of a questionnaire in 1980.

Information regarding the number of applications for residency positions in various specialties was statistically ana-

lyzed. A ratio of the number of total applications to the number of positions offered was calculated for each specialty for 1978 and for 1980 through 1983. The ratios represent the preference of graduating medical students for each respective specialty. The validity of using the ratios as the dependent variable in assessing preferences instead of the percentage of positions filled for each specialty could be questioned. The strongest reason for not using the percentage filled is that it is an interval-scaled number. Therefore, it is impossible to differentiate the magnitude of differences in preference. But by using ratios for each specialty, it is possible to determine how much more one specialty is preferred than another one.

The questionnaires were sent by the authors to the chairmen of anesthesiology departments at 108 teaching hospitals. The list of names and addresses for the survey was obtained from the Society of Academic Anesthesia Chairmen. The questionnaire was accompanied by a letter explaining the object of the study. To keep the responses confidential, only code numbers were used for identification. The chairmen were asked to report whether anesthesiology was independent or part of any other department, the number and categories of teachers and other personnel, and the personnel's work load in terms of teaching and anesthesia services in relation to the department's staff and financial resources. Regarding the teaching of medical students, the information sought was the number of students in the freshman medical class; the timing and duration of anesthesia teaching in medical school; and whether the clerkship in anesthesiology was required or an elective. The authors also asked whether the students were evaluated regarding anesthesiology learning by written or oral tests and whether the students reacted favorably to this learning experience by choosing anesthesiology as a specialty. The chairmen were also asked how many medical students from their department became anesthesia residents after graduating. Information was also gathered about the residents in the departments, because anesthesia residents provide valuable help both in informal teaching of medical students and anesthesia services. This information included the number of residents, the type of clinical anesthesia teaching and rotations, and evaluations of the residents' competence.

From the information obtained, the authors attempted to relate the number of students choosing anesthesia residency programs with different variables in the clinical clerkship.

Analysis of variance was used to test statistically the data obtained from the NRMP. The specialties were compared under the constraints of a completely randomized design. Individual comparisons between the anesthesiology mean ratio and the ratios of other specialties were performed post hoc using Tukey's HSD (honestly significant difference) test (4).

Prior to any statistical testing of the survey variables, the distributions of each were examined. For categorical variables, the distribution of the number of students choosing anesthesiology was examined for each level. Normality of the data was statistically tested using the Shapiro-Wilk (5) or Kolomogorov D (6) statistics according to the size of the sample. Because none of the data met the assumption of normality, ranked statistical methods were used for the most part in testing. Spearman's Rho was used to investigate correlations. Multiple regression was performed utilizing ranked data as suggested by Iman and Conover (7). The one exception was the use of the median test to investigate the relationships of categorical

variables to the number of students choosing anesthesiology.

To study further the relationships between the number of students pursuing anesthesiology and the number of anesthesiologists and certified registered nurse anesthetists (CRNAs) on the operating room floor at the same time, intervals of three were formed for both the M.D.s and the CRNAs. For example, suppose there were 13 M.D.s and 17 CRNAs. The anesthesia grouping would be the integer portion of 13 divided by 3, and the CRNA grouping would be the integer portion of 17 divided by 3. Once the groups were established for both anesthesiologists and CRNAs, the first- and second-order regression models were tested using the group interval numbers instead of the raw numbers of anesthesiologists and CRNAs.

Results

The mean ratio of medical student applications to anesthesiology resident positions was significantly different from many of the ratios for other specialties (Table 1). The ratios indicate the relative preferences for particular medical specialties. For example, the mean ratio for orthopedic surgery was 10.48; that is, there were 10.48 applications for each residency position offered. The mean ratio for anesthesiology was 3.92. Thus, the differences in the ratios showed that orthopedic surgery was preferred by the medical student more than twice as much as anesthesiology.

The medical specialties explained 76 percent of the differences in the mean ratios among the various specialties and yielded F statistic and p value of 13.48 and < .0001, respectively. Specialties that were significantly more preferred than anesthesiology were orthopedic surgery, obstetrics/gynecology, internal medicine, general surgery, diagnostic radiology, and pediatrics. Anesthesiology was preferred approximately twice as much as neurology and therapeutic radiology. This confirms quantitatively the observations that Graettinger (1) had made only qualitatively.

TABLE 1

Mean Ratio of Applications to Residency Positions at All U.S. Hospitals in 1978 and 1980–1983, by Specialty*

Medical Specialty†	Mean Ratio	S.E.M.
Anesthesiology	3.92	.92
Orthopedic surgery	10.48	1.34‡
Obstetrics/gynecology	8.74	.77‡
Internal medicine	7.16	.42‡
General surgery	6.62	.75‡
Diagnostic radiology	6.18	.70‡
Pediatrics	5.88	.49‡
Family practice	5.82	.27
Neurosurgery	4.48	.61
Dermatology	3.96	.35
Urology	3.92	.49
Otolaryngology	3.46	1.05
Pathology	3.08	.57
Physical medicine	2.86	.80
Psychiatry	2.64	.55
Ophthalmology	2.40	.26
Neurology	1.64	.38‡
Therapeutic radiology	1.38	.35‡

* ANOVA results: $F = 13.48$, $p < .0001$, R-square = 76 percent.

† $n = 5$ for all specialties.

‡ Significantly different from the mean ratio for anesthesiology ($p < .05$), Tukey's HSD test.

The total number of responses to the questionnaires was only 63 out of the 108 sent, despite two reminders. Of the 63 responding departments, 51 were independent, two were a part of the surgery department, and 10 others did not indicate their status. Of the institutions answering the questions, 26 handled between 10,000 to 20,000 anesthesia cases yearly, 12 had a case load of less than 5,000, 13 conducted between 1,000 and 5,000 anesthesia cases, and 9 had more than 30,000 such cases. The breakdown

for regional anesthesia (where only a part of the patient's body can be made painless for surgery by local anesthesia) had only one significant piece of data; 51 institutions were doing less than 5,000 regional cases, and only two had cases between 10,000 and 20,000; the others were in between. Twenty-nine anesthesiology departments had between 11 to 20 operating rooms (ORs) to work in, 17 had less than 10 ORs, and 11 had 21 to 31 ORs and other places of responsibility.

Staffing patterns in the departments were significantly related to the number of medical students choosing anesthesiology as a specialty (Figure 1). The most significant factors were the number of full-time faculty members and the number of residents already in the residency program (Table 2). This was not surprising, as it would be reasonable to believe that the more full-time anesthesiology personnel there are in a department, the greater the possibility of fully exposing the student to the purpose and direction of anesthesiology. This was further confirmed by the significant positive correlation for number of anesthesiologists normally on duty in the operating suite. Somewhat surprising was that there was no apparent advantage, at least as far as the medical student was concerned, in having board-certified anesthesiologists within the department. Finally, the number of part-time faculty members did not correlate with the number of students choosing anesthesiology. This demonstrates that hiring part-time faculty mem-

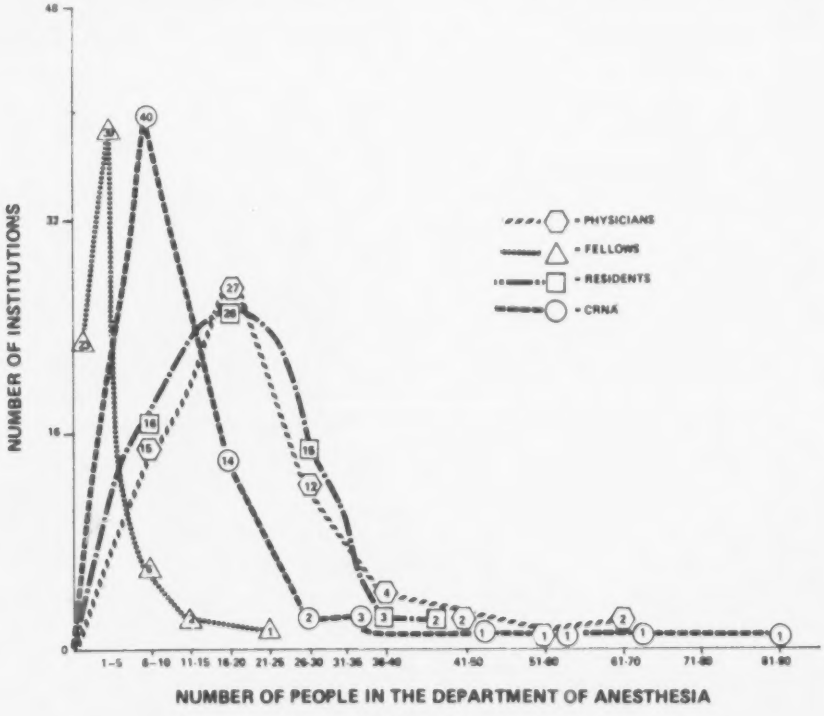

FIGURE 1
Staffing patterns in departments of anesthesia in 63 teaching hospitals, 1980.

TABLE 2

Correlation Coefficient (Spearman's Rho) for Number of Medical Students Choosing Anesthesiology and Quantitative Variables, as Reported by 63 Teaching Hospitals, 1980

Variable	Rho	*p* value	No.
Board-certified anesthesiologists	.22	NS*	61
Full-time faculty anesthesiologists	.38	.002†	63
Part-time clinical faculty	.04	NS	56
Residents	.38	.002†	63
Anesthesiologists on duty in OR	.26	.043†	62
CRNAs on duty in OR	−.21	NS	63
Clinics using anesthesiologists	.00	NS	62
Students in freshman class	.35	.005†	62
ORs in surgery suite	.17	NS	63
General anesthesia cases‡	.02	NS	62
Regional anesthesia cases‡	.05	NS	63

* NS = statistically not significant.
† Statistically significant.
‡ Number of cases per year.

bers will not ultimately affect the student's choice.

Another important factor affecting students choosing anesthesiology was support staffing patterns, especially those of CRNAs. Direct correlation of the raw data only suggested a negative relationship. But by grouping the anesthesiologists and the CRNAs in groups with three each, a significantly negative relationship is found (Figure 2). The overall regression model was significant ($p < .026$) as were the partial regression coefficients for the intercept ($p < .0001$), the number of physicians ($p < .021$), and the number of CRNAs ($p < .028$). The predicted values of the number of students choosing anesthesia were plotted against the intervals of physicians and CRNAs and represent the mean number of students expected to choose anesthesiology as a specialty for every three physicians and three CRNAs. The top regression line presents the effect of physicians without the influence of CRNAs in the operating room on the number of medical students choosing anesthesiology after graduating from school. The bottom line illustrates the negative effect on the number of students choosing anesthesiology when the CRNAs are also present and working with anesthesiologists.

Personnel from less than 8 percent of the responding anesthesiology departments performed duties on the obstetric ward, in the recovery room, or in connection with cystoscopies. The results show that there was no relationship between the number of students choosing anesthesiology and the presence of these services (Table 3). However, when considering duties performed in the intensive care unit (ICU), coronary care unit (CCU), and pain clinics, the sample sizes provided greater statistical power. A significantly greater number of students chose anesthesiology in hospitals where anesthesia services were performed in the ICUs and CCUs. Pain clinic duties performed by the students showed no relationship. Levin (2) showed that additional educational experience in various areas of anesthesiology would emphasize the full scope and broad view of the specialty and this would help most medical students appreciate and choose anesthesiology as a discipline. The results of the present study supported Levin's point only where

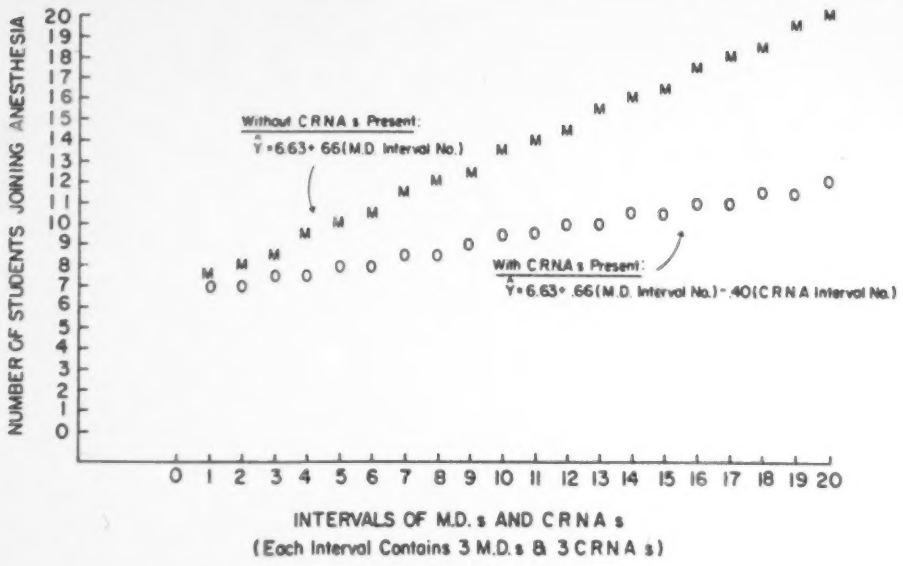
NUMBER OF STUDENTS JOINING ANESTHESIA
Without CRNA s Present:
Ŷ = 6.63 + .66 (M.D. Interval No.)
With CRNA s Present:
Ŷ = 6.63 + .66 (M.D. Interval No.) - .40 (CRNA Interval No.)
INTERVALS OF M.D. s AND CRNA s
(Each Interval Contains 3 M.D. s & 3 CRNA s)

FIGURE 2

Plots of the predicted values of the mean number of students choosing anesthesiology as a specialty in relation to the presence of physicians and certified registered nurse anesthetists (CRNAs) in the operating room, based on information from 63 teaching hospitals, 1980.

TABLE 3

Comparison of Median Number of Medical Students Choosing Anesthesiology and Qualitative Variables, as Reported by 63 Teaching Hospitals, 1980

Variable	*p* value
Status of department as independent body	NS*
ICU/CCU and pain clinic duties performed†	NS
ICU/CCU only	.036‡
Pain clinic duties only	NS
Obstetric duties performed	NS
Cystoscopy duties present	NS
Recovery room duties present	NS

* NS = Statistically not significant.

† ICU/CCU = intensive care unit/coronary care unit.

‡ Statistically significant.

ICU/CCU experience was considered. Additionally, the results indicated that the number of different types of clinics did not influence the student's choice.

Finally, various other factors related to the clinical rotation setting did not significantly add to the explanation for the present shortage of anesthesiology residents. The number of anesthesia cases had no direct relationship to the student's choice, and the number of operating rooms in the surgery suite had no bearing.

Discussion

The number of CRNAs in this country is almost twice the number of anesthesiologists, and together they provide the bulk of anesthesia services. No other medical specialty is so heavily dependent on the help of a nonphysician group for its services, and this situation is far from ideal, whereby all anesthesia care could be supervised by anesthesiologists.

The relative shortage of applicants for anesthesiology residency programs is reflected in the numbers of unfilled teaching positions (8, 9). According to reports, total budgeted and available teaching po-

sitions in anesthesiology in 1976 and 1982 were 1,506 and 2,228, respectively. In 1976 and 1982 respectively, 7.7 percent and 6.2 percent of those positions were unfilled. With two exceptions, family medicine and orthopedics, the unfilled rate in anesthesiology was the highest of all the specialties.

Similarly, the reports also indicate that in the recent past, possibly due to lack of interest on the part of U.S. medical graduates, a significant proportion of residents in anesthesiology were foreign medical graduates (FMGs). In 1974, the proportion was 54 percent; in 1978, it was 38.6 percent; in 1979, 35.7 percent; in 1980, 32.7 percent; and in 1981, 28 percent. More recently, however, even though the number of first-postgraduate-year positions in anesthesiology has not changed significantly, the percentages of FMGs have been showing a downward trend. The trend probably results from the larger number of U.S. medical students, from visa restrictions that have been imposed on FMGs, and from a stricter selection process.

Levin's (2) survey of graduating medical students regarding their attitude toward anesthesiology revealed that a majority of students developed specialty interests in the early years of medical school before they had had any contact with anesthesiology. In that study, medical students perceived anesthesiology as not concerned with primary care, as boring, as insufficiently covered in medical school, and as a specialty where the anesthesiologist appears to be taking orders from dominant surgeons. A significant number of students were not aware of the role of the anesthesiologist, for example, as a specialist in airway management or problems of chronic pain. Students also ranked anesthesiology lower for the choice of specialization as compared with other major disciplines. They were also concerned with the low status and prestige of anesthesiologists and the belief that an anesthesiologist's job can be performed by nonphysicians. The present study showed a definite negative influence when CRNAs were also working with anesthesiologists in the operating room (Figure 2). Does this mean that the mere presence of the CRNA directly and adversely affects the students? It is impossible to say conclusively from the analysis, but there may be a negative indirect influence.

Levin (2) reported that a significant portion (69.8 percent) of the medical school graduates in his study believed that the typical anesthesiologist was underworked. One reason for this belief might be based on what happens when the CRNA performs some of the anesthesia services. If the student believes the anesthesiologist is doing nothing else when he has been freed by the CRNA, then it is easy to see how the nurse could indirectly contribute to the stereotypic image.

The comparative lack of interest in anesthesiology is also evident in the present study when the numbers of applicants for the positions in the different specialties are compared (Table 1).

In 1977 Epstein (10) and colleagues projected increasing needs for manpower in academic anesthesiology for teaching and a higher demand for more anesthesiologists for anesthesia services in the hospitals. They wrote that the general shortage of physicians in anesthesiology and an increasing demand for anesthesia care had also led to the recruitment of residents with substandard training and that this further worsened the deficiencies.

The need for more members on anesthesia faculties cannot be satisfied by increasing nurse anesthetists or anesthesia assistants. Thus, it is evident from the reports that more efforts are needed be-

fore the future needs of anesthesiology can be satisfied. The studies have shown that the relative shortage of applications for anesthesiology residencies can be explained to some extent by several factors: inadequate staffing of anesthesiology teaching programs both in terms of quantity and quality, poor image of anesthesiology held by graduating medical students, increasing demand for anesthesia services, and immigration restrictions on foreign medical graduates.

The results of the present study point to the need for teaching hospital departmental actions to help reduce the present relative shortage of applications for residencies in anesthesiology. As the number of students choosing anesthesiology is directly related to the number of faculty members and residents in anesthesiology departments, it is important that all vacant faculty and house staff positions be filled and that teaching should emphasize the key areas of anesthesiology responsibility in the operating room and the ICU and the CCU. As the number of students choosing anesthesiology is affected in an indirect, negative manner by the amount of anesthesia services performed by the CRNAs, the dependence on them for support of the anesthesiologists should be reduced, at least in the educational setting.

Finally, every effort should be made by the anesthesiology profession to study how medical students' attitudes concerning anesthesiology are related to the various aspects of the teaching situation with the hope of establishing guidelines that would further promote anesthesiology as a promising specialty. For other specialties which make use of nonphysicians in the delivery of health care, the precise effects should be determined to see whether there are any negative influences on the students' choices in those specialties.

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COMMUNICATIONS

Practice Patterns of Graduates Of New Community-Based Medical Schools

William D. Marder

Approximately 40 new medical schools have been established in the United States since 1960. Some of these new schools have relied on community hospitals and local practitioners for teaching clinical skills rather than traditional university-managed medical centers. Medical schools that follow this pattern have been called "community-based" schools. Advocates for community-based schools hoped that they would be particularly effective in producing graduates who would enter general and family medicine (1). Early exposure to community practice, rather than academic practice, was expected to provide attractive role models for students (2). The study reported here compared the current practice patterns of graduates of the new community-based medical schools with those of graduates of more traditional medical schools, new and old, to determine how effectively the community-based schools have been accomplishing their goal.

To focus on physicians who have completed their graduate medical education, the analysis was limited to medical school graduates between 1970 and 1975. Each medical school was assigned to one of three categories. A school was classified as "new community-based" if it was founded after 1960 and did not manage its own medical center during the period of study (3). Nine of the 21 schools founded since 1960 and before 1971 can be considered to be community-based schools. Graduates of established schools, including those that developed new community-based branch campuses (for example, the University of Alabama and the University of Oklahoma), were included in the "older school" category to avoid ambiguities, because it was not possible to distinguish which campus a particular graduate attended. New (post 1960) schools which followed traditional organizational models are classified as "other new" schools.

Each physician included in the analysis was identified in the American Medical Association's 1981 year-end Physician Masterfile (4) as being in active, office, or hospital-based practice (excluded were physicians classified primarily as administrators, researchers, faculty members, residents, or fellows). Between 1970 and 1975, there were 676 graduates of community-based schools, 1,981 graduates of other new schools, and 59,908 graduates of older schools.

Results

Table 1 presents a comparison of the specialty distributions among the graduates of the three categories of schools. Of the graduates of the community-based schools, 17.3 percent termed themselves practitioners of general or family medicine, a significantly higher percentage than was the case for graduates of older schools (12.1 percent). In addition, there was a significantly smaller percentage of surgeons among the graduates of the community-based schools. For both of these specialties, the differences between community-based and older schools were statistically significant at the .01 level based on chi-square tests.

Overall, the specialty choices of the graduates of community-based schools and those of new but more traditional schools were not

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TABLE 1

Percentage of Characteristics of Patient Care Physicians Who Earned the M.D. Degree During 1970–1975, by Type of Medical School

Characteristics	School Attended		
	New Community-Based Schools	Other New Schools	Older Schools
Specialty			
General/family practice	17.3	15.1	12.1
Internal medicine	24.5	20.8	24.5
General surgery	16.1	16.0	19.8
Pediatrics	7.3	8.4	8.2
Obstetrics/gynecology	6.1	7.1	6.5
Psychiatry	4.4	5.1	5.1
Radiology	5.6	8.1	6.9
Anesthesiology	3.9	3.4	4.1
Pathology	2.1	2.8	2.4
Other	12.7	13.7	10.6
Sex			
Female	10.8	11.8	11.4
Male	89.2	88.2	88.6
State retention*	42.6	54.2	29.6

* Practicing in state in which the physician's medical school was located.

significantly different. The percentage of community-based graduates classified as practicing general or family medicine was slightly higher than for graduates of other new schools (17.3 compared with 15.1), but this difference was not statistically significant. However, both types of new schools produced significantly more graduates in general or family practice than did the older schools. Table 1 indicates that newness appears to be a more important factor in this respect than the way the school is organized.

In addition, as shown in Table 1, community-based institutions graduated the same percentage of women during this period as did other U.S. medical schools. Thus, the growing representation of women in U.S. medical schools was apparently independent of the type of school.

Graduates of community-based schools showed statistically significant differences in their willingness to practice in the state in which their medical school was located. These differences were difficult to interpret because they may reflect many factors, including the difference in preponderance of public schools in the three groups as well as different applicant pools (5).

Conclusions

The present study showed that new medical schools graduate students who, early in their careers, have different practice patterns than graduates of older schools. The graduates of new schools are more likely to: (*a*) enter general or family medicine and (*b*) practice in the same state as their medical school. The new community-based schools are particularly effective in producing general and family practice physicians.

What is the real cause of these differences remains an open question. A reexamination of the 1970–1975 graduates 10 years from now may show changes in their professional activities away from general medicine into more highly specialized care. In addition, a similar study, performed 10 years from now, using data for graduates of classes from 1980 to 1985, would not necessarily produce results similar to those in the present study. Finally, the schools themselves may change with time. Two schools classified as community-based in this study have recently opened their own hospitals. Consequently, their current graduates would be included in the "new, more traditional" category.

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Gender Composition of Medical Schools And Specialty Choices of Graduates

Carol S. Weisman, Ph.D.

Increasing percentages of women in U.S. medical schools since 1970 have been accompanied by a wider array of specialties chosen by women entering first-year residencies to the extent that a person's gender is becoming a less powerful predictor of specialty choice. Most notably, women have been less likely than in previous years to enter pediatrics, psychiatry, and the hospital-based specialties and have been more likely to enter internal medicine and obstetrics-gynecology (1, 2). Weisman (2) interpreted these macrolevel trends in the context of Kanter's theory that as the proportion of women in organizations reaches parity with men, women will be less likely to be entrapped in limited or stereotypically "female" roles (3). Weisman, however, did not examine data at the level of U.S. medical schools nor consider variations across medical schools in the effects of gender composition on specialty choice patterns. The latter should be studied in light of the statement of the Graduate Medical Education National Advisory Committee (GMENAC) that the educational environment is critical in determining individuals' specialty choices and the recommendation for greater sociodemographic diversity in medical school classes (4).

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Methods

In the present article, the author conducted an investigation of the effects of the gender composition of U.S. medical school classes on the specialty choices of graduates in the years 1970–1976, the period of greatest growth in the numbers of women in medical schools. National data on individuals were obtained from the American Medical Association and have been described elsewhere (2, 5); descriptive data on medical schools were obtained from the Institutional Profile System of the Association of American Medical Colleges.

In the analysis, the percentage of women in graduating medical school classes was the independent variable and demonstrated considerable variation across schools during the period studied. The specialty of first-year residency was the dependent variable. Since, according to Kanter's theory, higher "percent female" in a medical school is expected to be associated with less "role entrapment" of its female graduates, the present analysis focuses specifically on the choice of the traditional "female specialties" (pediatrics, psychiatry,

and hospital-based specialties) as opposed to all others. Results of the study for residency selection of pediatrics, the largest female specialty and the one demonstrating the most dramatic trends since 1970, are highlighted here.

Findings

At the medical school level, multiple regression techniques were used to examine effects of percent female and other medical school attributes screened for high intercorrelations (for example, public or private control, region, research expenditures) on the school's percent of women graduates entering pediatrics in the first year of residency. Equations were generated separately for the 1970 to 1976 graduation cohorts. In general, a higher percentage of women was found to be negatively but weakly associated with the school's output of women in pediatrics. This result was consistent with Kanter's theory. However, the school's level of research expenditures was the most consistent predictor, perhaps because research-oriented schools have dynamic pediatrics departments. The research expenditures of medical schools and percent female were not significantly correlated.

At the individual level, the effects of percent female and other medical school attributes on the medical student's choice of pediatrics were examined. Table 1 summarizes the results of several multiple regression analyses, including those for men and women combined and separated. The first row of the table shows that there was a fairly consistent effect of class gender composition on choice of pediatrics when only the individual's gender was controlled; this is an example of a "contextual effect" as defined by Firebaugh (6). The effect, however, was positive; higher percent female increased the likelihood that the individual would enter pediatrics. This effect was not statistically significant when other covariates were introduced nor when men and women were viewed separately, although the coefficients were generally in a positive direction.

The results were similar when the choice of any of the traditionally female specialties was viewed as the outcome variable.

Discussion

The analyses at the levels of both the school and individual disclosed only weak effects of medical school class gender composition on specialty choice patterns at graduation. Trends in the data were somewhat paradoxical; among medical schools, higher proportions of women tended to be associated with smaller proportions of women entering the traditional

TABLE 1

Standardized Partial Regression Coefficient of Choice of Pediatrics in First Year of Residency on Gender Composition of U.S. Medical School Graduating Classes, 1970–1976

Covariates Controlled	1970 (W=655*, M=7,527)	1971 (W=747, M=7,861)	1972 (W=770, M=8,287)	1973 (W=897, M=9,300)	1974 (W=1,232, M=9,704)	1975 (W=1,632, M=9,645)	1976 (W=1,707, M=9,627)
Individual's gender only	.024§	.011	.026§	.016	.033§	.028§	.027§
All covariates, including individual's gender†	.002	−.006	.009	.003	.019	.017	−.002
Equations for women separately‡	−.053	−.031	.062	.019	.009	.031	.030
Equations for men separately‡	.012	−.002	.003	.001	.021	.013	.009

* W = number of women, M = number of men.

† Covariates (in addition to individual's gender) are: school control (private or public); school region (northeastern/western or other); school research expenditures; average age of individuals in graduating class; individual's age at graduation.

‡ Covariates are same as above, excluding individual's gender.

§ Univariate F-test, $p < .05$.

female specialties; among individuals, graduating from a class with a higher proportion of women tended to increase the likelihood that *a woman would enter these* specialties. The findings at the individual level were not consistent with Kanter's theory but instead lent support to the GMENAC's suggestion that larger aggregations in medical schools of students with particular attributes and interests might create a peer group that reinforced or supported those orientations (7). Nevertheless, the associations found here were weak and should not be overinterpreted in view of the global trend toward diminishing sex differences in specialty choices.

Gender composition of medical schools may not be a critical variable in the specialty choice process due to historical factors. The entrance into medical schools in the 1970s of a large number of women influenced by the women's movement of the late 1960s could account for women's changing specialty choice patterns during the period observed in this study. For example, women's more frequent selection of obstetrics-gynecology may signal their growing sensitivity to women's health needs. In addition, the gender composition of medical schools is itself a product of a changing social climate in which federal legislation, such as Title VII of Public Law 92-147, the Health Manpower Act Amendments of 1971, and Title IX of the Higher Education Act Amendments of 1972 (8), reduced sex discrimination in medical school admissions and, presumably, encouraged a broader range of specialty opportunities for women within the profession. During the 1970s, women's specialty choice patterns were, therefore, likely to have changed independently of the gender composition of the particular medical schools which they attended.

Nevertheless, the variation across medical schools in patterns of women's specialty choice suggests that effects of various aspects of the educational environment (for example, female faculty role models) on future specialty choice patterns should be carefully investigated.

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